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Columbia University,

Health - Education Series, New York

INDUSTRIAL HYGIENE

By

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*"My people are destroyed for lack
of knowledge."*

—HOSEA iv. 6.

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INDUSTRIAL HYGIENE

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"It is but reasonable that Physick (medical science) should contribute its quota for the safety of Tradesmen (industrial workers), that they may follow their trades without injuring their health."—*Ramazzini, "Treatise on the Diseases of Tradesmen" (1670).*

"The canker of industrial diseases gnaws at the very root of our national strength. The sufferers are at least a third part of our population. That they have causes of disease indolently left to blight them and their work is an intolerable wrong. To be able to redress that wrong is one of the greatest opportunities for doing good that human institutions can afford."—*Sir John Simon, Medical Officer, Report to Privy Council of Great Britain, 1861.*

"We do not wish to see productive energy sapped by excessive toil or by labor under improper conditions. We want men protected from avoidable danger to life and limb, and to see a diminution in the shocking number of preventable casualties in our industrial employments, which constitute a disgrace to the country.

"We seek the dissemination of information with regard to the practical conduct of life, so as to remove the ills which are due to simple ignorance."—*Ex-Gov. Charles E. Hughes, "The Social Ideal."*

Conservation of the Living Machine

EFFICIENCY is the dominant idea in modern industry. Rising standards of living and diminishing natural resources make the haphazard methods of earlier days more and more inadequate. Raw materials are carefully conserved. Machinery is studied and simplified and made effective in the minutest detail. Special foremen are employed to superintend the distribution of work from hand to hand in the factory so that all waste of time and energy may be minimized.

One side of the problem is however still strangely neglected. The most important machine in every workshop is the living machine. In the cotton industry in 1905 interest on the ordinary money capital at 5 per cent would have amounted only to 30 million dollars against 96 millions paid out in wages, as interest on the life capital invested.

There is no other machine so directly responsive to slight changes in its sur-

roundings as the human body. A few degrees change in temperature make a vast difference in the efficiency of the worker, and so in the service which the employer receives for his wages, in the quantity and quality of work and freedom from breakage and waste of material.

If this is true for the employer it is of course far more true for the employee. Not only his efficiency, which determines his earning power, but his happiness and his health, perhaps his life, may depend on the conditions under which he lives during his working hours. Four out of five deaths in certain industries are due to industrial tuberculosis, which results from the breathing of irritating dusts. Yet the operative often unites with the factory owner in maintaining conditions which violate every principal of sanitation and hygiene, and lay upon both the burden that inefficiency brings in its train. It is not heartless cupidity on the one hand nor willful carelessness on the other. It is simply lack of knowledge of what is going on.

The Waste of Life on the Railroad, in the Mine and in the Shop

One of the most obvious and striking preventable wastes is that due to industrial accidents on railroads, in mines and in factories. About 10,000 persons are killed and 100,000 more or less seriously injured on the railways of the United States every year. Some 3,000 fatal accidents occur annually in the course of mining operations, and probably 5,000 deaths result from accidents in the operation of machinery in factory and workshop.

Much of the suffering and misery represented by these bald figures is preventable,—is prevented in other countries. Fatalities are four times as common among our railroad employees as among those of England, and other accidents seven times as frequent. Coal mining was nearly as fatal in Belgium between 1830 and 1840 as it is in the United States to-day, but the Belgians have cut their death rate down to less than one third of what it was.

Preventable Industrial Accidents

The responsibility for these conditions rests upon both parties to the industrial partnership,—upon employer and employee alike. Everyone who examines the problem with an open mind knows that few railroad officials and factory managers have done all that they might to provide safety appliances and to frame and enforce regulations against the dangers of the occupations for which they are responsible. Everyone knows that in mining and in manufacturing many accidents arise directly from the employment of children and ignorant persons at tasks for which they are manifestly not equipped. On the other hand it is equally clear that the employee frequently displays a reckless carelessness and a readiness to take chances which are so common in this country as to be almost a national characteristic.

At times, notably in railroading, the resources of labor organizations have been vigorously and successfully employed to thwart the enforcement of rules which were more beneficial to

them than to either their employers or the public. In Crystal Eastman's admirable study of work accidents in Pittsburg it appeared that out of 410 fatal accidents, the victim or his fellow-workers were responsible in 188 cases and the employer in 147 cases.

The phrase "Life is cheap," is worse than cynical, it is foolish. Aside from the moral issues involved in human suffering all waste must be paid for. Is it not time that the employers of America set themselves to remedy a condition that Governor Hughes rightly called a national disgrace by providing the safeguards that are now available,—the guards for belts and saws and revolving parts, such as are to be seen in the American Museum of Safety Devices in New York?

Is it not time that the workers of America addressed themselves seriously to their part of the problem and moved actively through their unions for the enforcement of a new standard of conscientious co-operation in the task of freeing their crafts from the preventable dangers that attend them?

The Inevitable, Residual Burden of Industrial Accidents

A large proportion of the injuries and deaths in railroading, mining and factory work could be prevented by the installation of safety devices and by proper care on the part of the operative. On the other hand a certain risk is essential to many employments. You cannot mine coal or make steel or operate railroads without a sacrifice of human lives. There is a noble saying over the door of the Sailors' Home at Lubeck, "It is necessary to sail the seas. It is not necessary to live." After all preventable risks have been minimized there must remain the stern fact that service means devotion,—even at times, of life itself. There is a note of high and unsuspected heroism underlying the most prosaic of modern industries.

It is important that the risk of inevitable accident should be recognized and appreciated and placed where it belongs. It is as much a necessity of production as the wearing out of machinery, and like the wearing out of machinery that part of it which can

be repaired—the money loss—should be charged against the industry itself and paid by the purchasers of the product.

Our American system of the past was as far as possible from accomplishing this end. The maimed employee or the widow of the fatally injured received no compensation at all unless legal proceedings were instituted in each special case, and then not unless it could be proved that the employer had been guilty of special negligence, the employee being held to assume all the ordinary risks of the employment and those due to the negligence of any other fellow-servants.

The practical result has been that on the one hand large expenditures have been made by employers for insurance and for the legal expense of contesting lawsuits, and that on the other hand a few employees with financial resources and acute legal assistance have mulcted their employers, while the great mass of the needy sufferers have received nothing or almost nothing. Thus in the study of work accidents at Pittsburg it appeared that of 235

married employees killed, 59 received nothing, 65 received \$100 or less, and 40 between \$100 and \$500. The burden of necessary accidents therefor falls under this system,—first upon the family of the innocent victim and then upon the community at large whose charitable agencies must be called in to furnish relief.

Workmen's Compensation Laws

The rational method of dealing with inevitable work accidents has been worked out successfully in all the principal European countries, and consists in a system of Workmen's Compensation, by which the victim of industrial accidents, except when caused by his own clear neglect, is entitled by right and without legal proceedings, to a proper money equivalent for the injury received. Steps have recently been taken for the introduction of such a system in this country along two distinct lines, by the voluntary initiative of manufacturers and by legal enactment.

The United States Steel Corporation, the International Harvester Com-

pany and other employers of labor have introduced of their own accord plans by which their employees may receive automatic compensation; and in New York and Montana and Maryland laws were passed in 1910 making such an arrangement optional or compulsory for certain classes of occupations.

In 1911, ten different states, California, Illinois, Kansas, Massachusetts, Nevada, New Hampshire, New Jersey, Ohio, Washington and Wisconsin, have already enacted laws bearing on this subject.

The movement for compulsory compensation has been temporarily checked by the decision that the New York law of 1910 was unconstitutional, but business men, labor leaders and economists are united in the conviction that in some way the system of Employers' Liability must be introduced in order that the burden of inevitable industrial accidents may be placed where it justly belongs.

Industrial Poisons

There are other classes of industrial dangers less obvious than mine ex-

plosions and railroad accidents, but none the less serious for those exposed to them. If a pound of lead drops on a workman's head the catastrophe is more obvious than if minute quantities of lead salts are taken into the system day by day, but the poisoning is as fatal as the accident, although only the medical man may perceive what is going on.

Dr. Hamilton of the Illinois Commission on Occupational Diseases was able to discover 578 cases of lead poisoning occurring in three years in the state of Illinois alone. The white lead industry, lead smelting and refining, the making of storage batteries, the making of dry colors and paints and the painting trade were the five principal industries affected, but occasional poisoning occurred in many other crafts.

The victim, after a period of general disturbance, headache, loss of appetite, etc., is usually seized by an acute attack of colic, "painter's colic," as it is rightly called. If he continues at work and adds day by day to the stock of poison in his system, by

breathing lead dust or by getting small particles of it into his mouth with his fingers or on his food, the condition becomes chronic. Gradually the whole system is poisoned, and death results from the injury to some vital organ; or acute nervous symptoms may set in, paralysis of local muscles, "wrist drop," so-called, or epilepsy and insanity.

John B. Andrews in Bulletin 86 of the United States Bureau of Labor reports that 65 per cent of the employees in American match factories are working under conditions which expose them to the fumes of phosphorus and the danger of "phossy" jaw, a loathsome disease in which the bones of the jaw ulcerate and are gradually eaten away.

The New York and New Jersey section of the National Civic Federation in three months' time found 60 cases of mercurial poisoning, a nervous disease called in the trade "the shakes," among the hat makers of Brooklyn, Newark and Orange as a result of their poisoning by the mercury salts used in preparing felt.

Thirty other industrial poisons are

listed in a recent German report, of which most are less deadly, but some like benzine and wood alcohol are perhaps even more serious because of the large number of operatives exposed to their effect.

Prevention of Industrial Poisoning

All these industrial poisonings are preventable,—are largely prevented,—by other nations. Fumes can be drawn off by special ventilation, and the introduction of the poison by the mouth can be forestalled by cleanliness, the separation of workrooms and lunch rooms, washing of hands and change of clothes on leaving the workroom. In many instances less poisonous substitutes can be introduced, as in the case of matchmaking.

The use of white phosphorus (the poisonous kind) is forbidden by law in France, Denmark, Italy, Germany, Great Britain and several other European countries; and a law having the same effect has been introduced in our own Congress.

The use of poisonous lead compounds is still permitted, but in Eng-

land and Germany is so hedged about with stringent regulations as to be robbed of its worst dangers. Large English white lead factories under the most careful supervision frequently show not a case of lead poisoning for several successive years, while Dr. Hamilton found 25 cases during one year in a "model" Illinois factory employing 200 hands.

Strict sanitary regulations and regular medical inspection must be introduced in American trades exposed to such poisons if the employees are to be protected against these unnecessary dangers.

Tuberculosis in the Dusty Trades

There is another problem more serious still,—one which is perhaps indeed the central problem of factory sanitation,—that of industrial tuberculosis. The trades exposed to lead and phosphorus and other acute poisons are small ones, and, serious as the danger is for those exposed, the death roll is not a long one. On the other hand the bad air and the dust to which the workers in many of our greatest in-

dustries are exposed work their insidious effects upon hundreds of thousands.

Tuberculosis is pre-eminently a social and an industrial disease, for the reason that it is a disease due to bad living and working conditions, to insanitary tenements and workrooms. Two factors must contribute to every case of consumption,—the germ and a lowered vitality on the part of the patient. Preventive measures must therefor follow two lines, the care of sputum of the consumptive, which is the chief agent for the distribution of the germ, and the maintenance of conditions which will keep those not seriously infected in condition to resist the ravages of the occasional germs which are sure sooner or later to gain an entrance.

The normal body has its “fighting edge” and can protect itself against the tubercle bacillus if given a fair chance, but the lung tissue which is lacerated by sharp particles of granite or steel quickly succumbs to the bacterial invader.

In dusty trades, like stonecutting and

cutlery working and emery grinding, 75 per cent of all the deaths among operatives is often due to tuberculosis, against 25 per cent for the normal adult population. This may be fairly interpreted as meaning that the actual death rate from tuberculosis in these trades is from two to four times as high as in a corresponding average population; in other words, three or four or five out of a thousand of these workers are sacrificed every year to the conditions under which they labor.

In other industries where there is less dust, or softer less irritant dust of animal or vegetable origin, the damage is less serious, but is nevertheless real and important. The investigation made by the Massachusetts State Board of Health in 1907 showed that of 4,399 dust-producing machines in shoe factories 2,769 were not properly equipped with devices for dust removal. Such conditions exist in very many of the large and small industries of this country; and though the total resulting cost in life and health is impossible to estimate with any accuracy it is unquestionably a very large one.

Protection of the Worker from Harmful Dusts

This damage like that which results from accidents and poisonings is in large degree preventable. There are three principal methods of dealing with it. In the first place there are some industries in which the original discharge of dust into the air may be prevented without any serious impairment of efficiency.

Wet grinding for example may be substituted for dry, or the process which evolves dust may be carried on in a closed vessel as is done in certain of the newer lead factories. Secondly, where the formation of dust is essential it can usually be removed and the worker protected from its effects by the installation of hoods equipped with ducts and fans by which the dusty air may be drawn away from the part of the machine where it is formed. The provision of such a device is required by law in many states, but the requirements are general and as a rule inadequately enforced.

It is morally the duty of every employer who maintains emery wheels,

buffing wheels or any other dust producing device to see that they are equipped not merely with hoods and suction but with hoods and suction adequate to secure real protection against the dangers to which his workmen are unknowingly exposed.

Respirators

Finally, in certain trades, the elimination of dangerous dusts is practically impossible. This is true in some processes of granite working. In such cases there remains only one remedy, the wearing of respirators of some efficient type which will keep the dust surrounding the worker out of his nose and throat and lungs. Respirators are uncomfortable and annoying; and here comes in the worker's responsibility for industrial disease.

Often he refuses to protect himself in this way, and even in the case of the suction device which guards him from the dust of grinding wheels he frequently removes the hood if it be detachable in order that he may work a little more conveniently. In these precautions and in the prevention of pro-

miscuous spitting which spreads the germs the employee must do his part if the burden of needless industrial disease is ever to be lifted.

Air Conditioning for the Living Machine

Even dust is perhaps less important as a menace to the health and efficiency of the worker than the overheating and under-ventilation which is so general in factories and workshops of all kinds, and which though far less immediately serious in its action gradually undermines the strength and vigor of the whole industrial army. There is no single factor which so directly and strikingly affects the tone of the human body as the physical condition of the atmospheric ocean in which it is bathed.

The contrast between one's feelings and one's effectiveness on a close, hot, muggy day in August and on a cool, brisk, bright October morning is sufficiently obvious, yet many a factory operative is kept at the August level by an August atmosphere all through the winter months. He works list-

lessly, he half accomplishes his task, he breaks and wastes the property and the material entrusted to his care. At the close of the day he passes from the overcrowded, overheated workroom into the chill night air, and with lowered vitality falls a prey to minor illness, colds and influenzas, if not to the great enemy, tuberculosis, always lurking in the background.

The Danger of Overheated Air

Sanitary opinion in regard to air supply has made great advances in recent years,—notably in the recognition that it is no mysterious poison that makes bad air harmful but rather its physical condition in regard to temperature and humidity. The chief thing that produces discomfort and danger in an ill-ventilated room is the fact that the air has become overheated and either too moist or too dry.

The human body is adapted to a temperature of 68° to 70° and a relative humidity of 60-70 per cent, and great deviation from these limits means an inevitable deterioration in efficiency

and a lowering of health tone that makes it a prey for any sort of disease.* In particular a rise of the thermometer over 70° should never be permitted except when the outdoor temperature is above this limit; and a superintendent who does not keep a thermometer in every workroom and see that it is kept below 70° is unconsciously neglecting his own interests as clearly as if he permitted his lifeless machines to run in such a way as to rack themselves to pieces.

How to Secure Fresh Air

In small workrooms which are not overcrowded, proper air conditions may be maintained without special ventilation by the intelligent use of doors and windows. Hot vitiated air tends to rise, and the Hygienic Window is one which is open a little at the top

*The relative humidity or moistness of the air is best measured by the use of a wet and dry bulb thermometer. The temperature of the thermometer whose bulb is kept moist by a saturated cloth is lowered by evaporation which is more rapid the drier the air. The best form of wet and dry bulb thermometer is the Sling Psychrometer described in Bulletin 235 of the United States Weather Bureau, and both this and a simpler and fairly accurate instrument, the Hygrodeike, may be bought of any instrument maker.

to allow the exit of foul air and open a little at the bottom to permit the entrance of a fresh supply. Even strong draughts are less harmful than is commonly supposed and everyone is more comfortable if the heat and the odors which the body gives off are swept away by moderate steady currents.

A screen of copper wire may be made to fit into the lower window opening in order to prevent excessive draughts, and in cold weather perhaps re-enforced by covering it with cloth. At the lunch hour and before and after hours every workroom should be thoroughly flushed out and cleansed by throwing open all the windows available.

With large and crowded workrooms special ventilation must be provided by means of ducts and fans. In the design of such systems care should be taken to secure efficient distribution of air to all parts of the room. A factory is not a simple box in which air will automatically distribute itself if only the requisite supply is forced into it at one or a few isolated points.

Furthermore a ventilating system

must be intelligently operated as well as scientifically installed. The air which is supplied must be of the proper temperature and humidity, and if the engineer in charge of the system cannot give skilled attention to such details disappointment is almost certain to ensue.

The Economic Value of Factory Ventilation

All these provisions cost money and require care in construction and in maintenance. For a large establishment where such special ventilation is required there is however little doubt that the time and money spent will bring a direct return in increased efficiency of production. There is plenty of evidence that such has often been the case.

The ventilation of the United States Pension Bureau reduced the days of absence of employees from illness by 46 per cent. The installation of a simple ventilating system in the Cambridge telephone toll room cut the winter absences by 58 per cent.

Mr. D. D. Kimball, in a recent article, quotes Townsend Grace Company as claiming that a ventilating system in their straw hat factory paid for itself in one year; and he cites a printing establishment in New York in which "a ventilation system was installed because of the insistence of the State Department of Labor that the law be complied with, the order having been resisted for two years.

After the system had been in use a year the proprietor said that had he known in advance of the results to be obtained no order would have been necessary to have brought about the installation. Whereas formerly the men had left work on busy days in an exhausted condition, and sickness was common, now the men left work on all days in an entirely different condition, and sickness had been very much reduced. The errors in typesetting and time required for making corrections were greatly reduced."

Eye Fatigue and Eye Strain

Another point in which there is ample opportunity for practical im-

provements beneficial to employer and employee alike is in respect to the lighting of factories and workrooms. The Massachusetts State Board of Health in the report to which reference has been made points out that:

“It is a well-established fact that either the over-use of the eyes, or the use of eyes under bad conditions, may give rise to eye fatigue or to eye strain; and many eye specialists believe that at least 80 to 90 per cent of headaches are dependent on eye strain.

With these facts in mind it is impossible to ignore the probability that many individuals working by gaslight, or even electric light, in dirty, unpainted, overheated rooms, with impure air and excessive moisture, for ten hours a day, or merely for the last two hours during the day, use up a great deal of nervous energy and suffer from eye fatigue or eye strain, and its consequences.” The danger from accidents is also undoubtedly increased by eye strain, defective vision and dim light.

Yet the Massachusetts Board found that little thought had been given in

mill construction, particularly in the textile industry, to providing proper lighting for the work to be done. Many rooms were of old construction, with low ceilings, small windows and small panes of glass. In the middle of large rooms and in basements conditions were particularly bad.

Aside from structural defects, too, the failure to keep walls and ceiling clear and white and the infrequent washing of the windows contribute in large degree to make lighting inadequate and harmful. Where artificial light is provided it may frequently be wrongly placed so that the workbench is insufficiently illuminated or, what is quite as bad, so that a direct glare is thrown into the worker's eyes.

The Physical Condition of the Worker

So far reference has been made chiefly to the environment of the worker, to the light and air which surround him and affect his activities, to the poisons and dust and dangerous machinery which may work injury to him. There is another factor to be con-

sidered however,—the living worker himself and his varying conditions of health and disease which interact with the external world about him.

Special foremen are provided to inspect machines, to replace worn parts, to regulate speed with painstaking care. As a rule there is no department to care for the men who run the machines, the human factor in production. Yet in some cases the employer may well go beyond the provision of sanitary surroundings and concern himself directly with the physical condition of the worker himself.

Medical Supervision

In highly dangerous occupations like those which involve exposure to lead or other acute poisons medical supervision of the employee is almost imperative. In England it is required that men who are to work with dangerous lead compounds must be examined before doing so in order that it may be certain they are in good enough condition to warrant the risk, and they must be periodically examined during

the period of their employment in order that if disease develops it may be detected in its early stages before it is too late. The Massachusetts law makes a similar provision for minors employed in factory work.

In establishments like the American Steel and Wire Company and the Cleveland Hardware Company, where much dangerous machinery must be used, emergency rooms are equipped for the prompt treatment of minor injuries; and they have more than proved their worth in preventing slight accidents from developing into serious disabilities.

Certain large industrial plants have gone farther still, and have engaged nurses or doctors to be regularly at the factory for consultation and to visit employees who desire it in their homes and there give them free medical care.

Of such a plan for a visiting nurse as worked out by the Waltham Watch Company it was stated: "It is almost impossible to estimate the ground which has been gained in preventing absences from work, prevention of

contagion and infection, especially at times when there is a prevalence of disease or possibly a threatened epidemic.”

Overstraining and Overspeeding of the Human Machine

There is still one more problem which deserves brief notice in any consideration of the factors which affect the health and comfort and productivity of the worker. Work that is too severe or too long continued for the strength gradually saps the vitality and brings sickness and suffering and incapacity in its train as surely as the factory conditions which produce lead poisoning or industrial tuberculosis.

The operative is as easily injured by overspeeding as the most delicate machine, and prolonged effort leading to undue accumulation of the so-called “toxin of fatigue,” gradually undermines the strength and vigor of the strongest.

The legal regulation of hours of labor and of the conditions under which women and minors may work in

various industries is a complex problem with its social and economic as well as its physiological and humanitarian sides. Rash and ill-advised interference with the inter-relations of society may do more harm than good. Yet it is clear that labor which works permanent damage to the worker is harmful to all parties concerned.

Life capital must not be wantonly wasted if industrial leadership is to be maintained; and, in particular, working conditions which are injurious to women and children must be controlled, for on the next generation the future of the nation must depend.

Welfare Work a Separate Problem

It should be recognized quite clearly that such sanitary and medical provisions as have been discussed bear no necessary relation to the sort of semi-philanthropic effort which has come to be known as Welfare Work. In making provision for the safety and comfort of his operatives an employer may recognize one or all of three distinct motives.

In the first place working conditions in harmony with safety and healthfulness are due to the employee on the ground of simple right and justice. It is clearly unfair that preventable dangers should be allowed to kill and maim and invalid the worker without his fault and in the course of his necessary daily toil. Most of the problems which have been considered belong in this class, and the employer need only be actuated by a sense of common justice in dealing with them.

In the second place an employer may do more for his workers than they can demand of right, from a motive of intelligent self-interest. This impulse and that of justice combine to inspire improvements in light and ventilation which bring direct return in the productivity of the worker. The establishment of dispensaries and the employment of doctors and visiting nurses is not a response to any inherent right of the worker; but in certain cases it has proved so advantageous to the employer as to be justified on broad business grounds.

Finally, in the third place, some factory owners have gone beyond the demands either of justice or of direct self-interest, and have embarked on undertakings which can only be regarded as philanthropic in character.

The establishment of libraries, educational centers, clubhouses and gymnasias, the conduct of picnics and other festivities, the foundation of savings and loan associations, and the construction of homes, model villages, etc., are beyond the scope of the business itself and are in the nature of voluntary benefactions of the employer to the employee.

An Important Distinction

These activities, to which the term Welfare Work properly applies, belong to a different class from those previously considered. Anything which directly promotes the conduct of the business may be offered by the employer and accepted by the employee without hesitation. Favors however can only be given and taken when a spirit of real sympathy exists.

This is the reason why Welfare Work as such has sometimes been a success and sometimes a disappointing failure. When gifts are bestowed in a patronizing spirit or in order to cover the denial of important fundamental rights they are not likely to find a cordial response.

The worker has been described as a living machine. He is a machine from the standpoint of physiology; but in the sphere of human relation he is not a machine but a human being.

He has a right to be consulted as to what shall be done for him. In the matter of receiving favors he must have the opportunity to accept or to decline with dignity and self-respect.

Philanthropy between employer and employee may or may not be a good thing, depending on the spirit in which it is offered and the tact with which it is carried out. The measures which directly promote the safety and health and effectiveness of the worker by ensuring to him the most favorable conditions under which to labor,—these measures stand on a wholly dif-

ferent basis and are always and everywhere justified by their results.

The Common Interests of Employer and Employee

In certain aspects of their common work employer and employee inevitably find themselves in a position of antagonism. What is given to one is taken from the other. The controversy may be acrimonious or it may be firm and good tempered; but it is there. In the matter of hygiene and sanitation however there is no conflict of interests.

Sickness and inefficiency help nobody. It is just so much taken out of the sum of human happiness and prosperity,—a burden whose load is shifted from one to another in the complex scheme of society until each one bears his part. In preventing the careless and ignorant waste of health and strength the mill owner and the labor leader can stand shoulder to shoulder as workers for their common good.

Human Engineering

To the far-sighted employer human engineering should be an integral factor in his business. The selection of workers physically adapted to their labor, the maintenance of the best practical conditions for its prosecution, the elimination of all possible dangers and the proper compensation for those risks that must occur, these are as essential to the successful conduct of a great business as any of its mechanical or financial problems. Along with the Finance Department, the Mechanical Engineering Department, the Sales Department and the rest should go a Department of Human Engineering; and if it be conducted in the proper spirit so as to invite co-operation rather than distrust and hostility this is one department in which the intelligent employee will be every whit as actively interested as the men who have it directly in their charge.

Is it too much to hope that a broad and comprehensive policy in regard to these common problems of hygiene and sanitation might so bind together

employer and employee as to make for mutual comprehension in a much wider field? Beyond the limits of physical efficiency are other less definite but fundamental interests, for after all industrialism at bottom is not a class struggle but a part of the fight all mankind is making against the common enemies of want and ignorance and disease.

In a deep and a real sense we are all shoulder to shoulder, and the enemy is not so much human selfishness as human ignorance and human limited capacity. It has been well said that,*
“If a company can be prompted and sustained by a spirit that industry can do something more than to produce products and profits, then if a man falls in the ranks whether he is a private or a general he has fallen in a cause that is worth while.”

* Mr. E. A. Bancroft, International Harvester Co.

HEALTH AXIOMS AND MAXIMS FOR THE WORKER

Compiled by the Secretary, Health-Education League.

My people are destroyed for lack of knowledge.
—*Hosea iv. 6.*

“A law of Nature is as sacred as a moral principle.”—*Louis Agassiz.*

“The conservation of our national resources is only preliminary to the larger question of national efficiency.”
—*Theodore Roosevelt.*

“Nothing too much.”—*Aristotle.*

“If pure air could be breathed in factories, stores, houses—including bedrooms—it is probable that one half of the hospitals could be closed and one half of the world's diseases could be prevented.”—*Ellen H. Richards.*

“Windows were made to be OPENED.”—*Florence Nightingale.*

“The preservation of health depends in great part upon food *well* cooked and *carefully* eaten.”—*Dr. William Osler.*

“*When* and *how* is often more important than *what* one eats. Do not eat when very *tired* or *worried* or *angry*.”

“A good joke or laugh is often better than a pill to aid digestion.”—*Dr. H. Sterling Pomeroy.*

“It is quite probable that half or two thirds of the food we now eat, if *properly cooked and thoroughly chewed*, would serve us amply.”—*Ellen H. Richards.*

“Many dig their graves with their teeth.”

“Keep the *sewers* of the body *open*. There should be one good free movement of the bowels *regularly* every day.”

“Sleep as much as you can,—never mind about the old proverbs,—*and always in pure, fresh air*. Get up, if possible, only when you have had your sleep *out*, and feel rested. To wake growing boys and girls out of their unfinished sleep is harmful.”

“Sunlight, the great and potent destroyer of disease germs, is a guardian angel of your household.”

“A reasonable amount of work is essential to physical and mental health; but overwork, over-speeding, fatigue beyond a certain point, whether in in-

dustry or athletics, are poisoners and wasters of life."

"Play, recreation, is almost as necessary for right living as work, but it must be *wholesome*, neither the *kind* nor the *pace* that kills."

"Even the moderate use of intoxicants interferes with the steadiness and swiftness of nerve action and reaction, and increases very much the danger of accidents."

"Habits of cleanliness can be maintained even in the grime of work. They mean health and life. Never eat or handle food without first *thoroughly* washing your hands.

"FOREMEN: Never spit on the factory stairway or floor, especially when you have a cold, nor allow your men to do so. Precept and example on your part will greatly help to prevent filthy, unsanitary spitting and the spread of contagious diseases."

"The use of the promiscuous drinking cup in shop or factory, or in any public place, is forbidden by law in many states, and is always and everywhere a menace to health."

“Pain is usually a danger signal for some violation of a law of health.

“Do not *drug* the pain to silence—except under the advice of a *good* physician.

“Heed the warning. Find out the *cause* of the pain. Take the path of recovery and safety *in season*.”

“Worry is a foe of the mind and of health.

“There are things that *can* be helped, and things that *cannot* be helped. Worry is useless in either case.

“*Just so far as you can*, avoid the *causes* of worry, excess, disease and debt, by means of intelligent thrift, care and moderation.”

“Our best protection against diseases of all kinds is the power of a strong vital resistance, due chiefly to the white cells of the blood.

“Anything that weakens this resistance, whether it be excessive alcohol, chilling, exposure, dust, over-fatigue or anything else, cripples our defense and exposes us to the attacks of the enemy.”

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